U4:L1 Intro to Radicals

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Radical Symbol

$$5\sqrt[3]{7}$$

Coefficient
of the radical
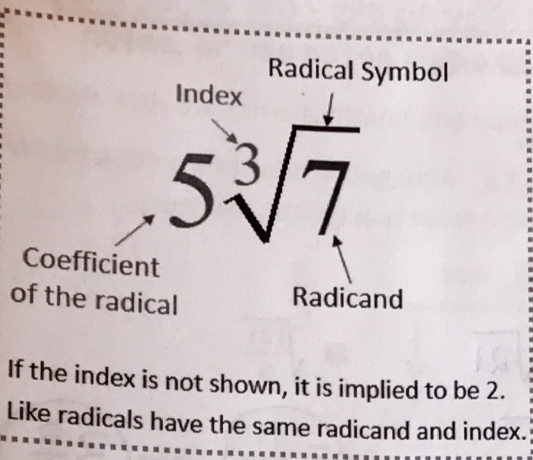
Radicand

GRADE TEN REVIEW!

If the index is not shown, it is implied to be 2.
Like radicals have the same radicand and index.

Rules for Simplifying Radical Expressions
1. No radicand can have perfect square factors other than 1.
2. No radicands can contain fractions.
3. No radicals can appear in the denominator of a fraction.

Product Property of Square Roots

For any positive real numbers a and b, $\sqrt{a \cdot b} = \sqrt{a} \cdot \sqrt{b}$.

Example 2: Simplify the following. Show your work.

$\sqrt{18} = \sqrt{3 \cdot 3 \cdot 2}$ Prime factorization of 18

$= \sqrt{3^2} \cdot \sqrt{2}$ Product property of square roots

$= 3\sqrt{2}$

1) $\sqrt{140} = \sqrt{14 \times 10} = \sqrt{7 \times 2 \times 2 \times 5} = 2\sqrt{5 \times 7} = \boxed{2\sqrt{35}}$

2) $\sqrt{72x^3y^2} = \sqrt{9 \times 8 \cdot x \cdot x \cdot x \cdot y \cdot y} = \sqrt{3 \cdot 3 \cdot 2 \cdot 2 \cdot 2 \cdot x \cdot x \cdot x \cdot y \cdot y}$

$= 3 \cdot 2 \cdot x \cdot y \sqrt{2x}$

$= \boxed{6xy\sqrt{2x}}$

3) $\sqrt{5} \cdot \sqrt{35} = \sqrt{5} \cdot \sqrt{5 \cdot 7}$

$= \sqrt{5} \cdot \sqrt{5} \cdot \sqrt{7}$

$= \boxed{5\sqrt{7}}$

Quotient Property of Square Roots

For any positive real numbers a and b, $\sqrt{\dfrac{a}{b}} = \dfrac{\sqrt{a}}{\sqrt{b}}$.

Example 3: Simplify the following. Show your work.

$$\dfrac{\sqrt{56}}{\sqrt{7}} = \sqrt{\dfrac{56}{7}} \qquad \text{Quotient property of square roots}$$
$$= \sqrt{8}$$
$$= \sqrt{4} \cdot \sqrt{2}$$
$$= 2\sqrt{2}$$

1) $\sqrt{\dfrac{34}{25}}$

$= \boxed{\dfrac{\sqrt{34}}{5}}$

2) $\sqrt{\dfrac{84}{4}} = \sqrt{21}$

$= \sqrt{7 \times 3}$

$= \boxed{\sqrt{21}}$

3) $\sqrt{\dfrac{121}{9}}$

$= \boxed{\dfrac{11}{3}}$ OR $\boxed{3\dfrac{2}{3}}$

Rationalizing the Denominator

The process of eliminating a radical from the denominator of a fraction by multiplying both the numerator and the denominator by an appropriate radical.

Example 4: Rationalize the denominator and simplify. Show your work.

$$\dfrac{\sqrt{5}}{\sqrt{3}} = \dfrac{\sqrt{5}}{\sqrt{3}} \times \dfrac{\sqrt{3}}{\sqrt{3}} \qquad \text{Note that } \dfrac{\sqrt{3}}{\sqrt{3}} = 1$$
$$= \dfrac{\sqrt{15}}{3}$$

1) $\dfrac{\sqrt{7}}{\sqrt{12}} \times \sqrt{\dfrac{12}{12}}$

$\boxed{\dfrac{\sqrt{84}}{12}}$

2) $\sqrt{\dfrac{11}{7}} \times \sqrt{\dfrac{7}{7}}$

$\boxed{\dfrac{\sqrt{77}}{7}}$

3) $\sqrt{\dfrac{3}{5}} \times \sqrt{\dfrac{5}{5}}$

$\boxed{\dfrac{\sqrt{15}}{5}}$

4) $\dfrac{3\sqrt{5}}{\sqrt{3}} \times \sqrt{\dfrac{3}{3}}$

$\dfrac{3\sqrt{15}}{3} = \boxed{\sqrt{15}}$